

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FOREST TRAILS AND LANDINGS

(Acre)

CODE 655

DEFINITION

A route, travel-way or cleared area within a forest.

PURPOSES

- Provide access to forest stands for management.
- Provide access for removal and collection of forest products.
- Provide access to forested areas for recreation.
- Minimize onsite and off-site damage to resources during periods of access.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on forested areas.

The practice does not include permanent logging and access roads.

Permanent logging and access roads which will receive continual use should be designed according to the standard for Access Road (Code 560). Access roads are engineering practices which require more detailed layout and design.

Forest trails are unsurfaced, single lane paths or narrow roads used to move forest products to an access point, manage, and provide access for recreation. They may be steeper and narrower than an access road and traffic may be limited or eliminated after completion of logging. Many of the same construction techniques and criteria apply; however, forest trails do not require detailed design or note-keeping.

The main difference between a primary trail and a secondary (skid) trail lies in the degree of preparation prior to use. Primary trails should be flagged, cleared, and graded. Secondary trails which are used to transport logs from stump to the main trail are usually not graded and need only a minimum amount of clearing.

CRITERIA

Resource Protection

Timing and use of equipment will be appropriate for site and soil conditions to maintain site productivity and minimize soil erosion, displacement and compaction.

Construction of trails and landings as well as logging is to be avoided during wet seasons on soils which have limited trafficability.

Trails and landings will be of a size, gradient, number and location to economically and efficiently accomplish the intended purpose and expected traffic and equipment. They shall be configured to minimize adverse onsite and off-site impacts, such as accelerated erosion, riparian zone degradation, stream channel and streambank damage, hydrology modification, other water resource damage, aesthetics or unacceptable damage to advance regeneration, residual growing stock, wildlife habitat, fragmentation or restrictions to wildlife movement.

Slash, debris and vegetative material left on the site after construction will not present an unacceptable fire or pest hazard or interfere with the intended purpose. Material should not be left in locations that will have adverse impacts on wetland, riparian or in-stream aquatic habitats.

Where possible, place trails on gentle side slopes rather than on ridgetops. Avoid wet floodplain soils where drainage is difficult to establish and maintain.

Drainage is to be provided to prevent rutting of the trail surface and unacceptable soil compaction.

Areas where soils are subject to mass movement shall be avoided to prevent landslides.

Forest trails that slope toward intermittent and perennial stream crossings should have effective water control measures installed to protect stream channels from direct surface runoff.

Rock riprap or other energy absorbing means should be used as needed to ensure stable water control outlets.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

**NRCS, NC
February 2002**

Consider cultural resources and environmental concerns such as threatened and endangered species of plants and animals, natural areas, and wetlands.

Seeding

Trails and landings shall be revegetated according to the standard for Critical Area Planting (Code 342) if necessary to control erosion.

Level and gently sloping sections of trails and landings should be seeded with plants appropriate for wildlife habitat and food if landowner objectives allow. See Upland Wildlife Habitat Management (Code 645).

Comply with applicable federal, state, and local laws and regulations during the installation, operation, and maintenance of this practice, including the state's forest practices guidelines.

Location

Landings should be located on elevated sites away from streams and streamside management zones (SMZ). They should be situated on gently sloping sites to provide adequate drainage.

Landings and trails will be kept to the minimum size and extent needed to accomplish the job.

On steep grades, primary harvest trails should proceed in a slant or zig-zag pattern to break the grade and avoid continuous steep grades.

Skidding will not follow the natural drainageway of any perennial, intermittent, or ephemeral stream.

Design and Construction Techniques

Water breaks, (including rolling dips), broad-based dips, and other drainage measures for trails shall be of sufficient size, intervals and gradient for adequate drainage and erosion control.

Broad-based dips are shallow, wide diversions usually used on trails having a gradient of 10 percent or less. The bottom of the dip will be outsloped 2% to 3% maximum and extend the full width of the roadway. The dip and reverse grade section may require bedding with 3 inch crushed stone in some soils for stability and to prevent unacceptable rutting.

Broad-based dips should be spaced according to the following formula and table.

$$\text{Spacing in feet} = \frac{400}{\text{Slope \%}} + 100$$

Road Grade	Approximate distance
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(percent)	needed between dips (feet)
1	500
2	300
5	180
10	140

Broad-based dips should be designed and installed as shown in Exhibit 1.

Water breaks can be used on trails up to 25 percent grade and should be installed at an angle of 30 degrees or less down slope depending on the grade of the trail. Steeper trail grades require less down slope angle. The outflow end of the water break should be open to keep water from accumulating, and be protected by a buffer or filter zone of undisturbed forest floor to filter the sediment out of the water and prevent erosion. Water breaks will be designed as shown in Exhibit 2.

Water breaks should be spaced according to the following table as outlet conditions allow.

Road Grade (percent)	Approximate distance between water breaks (feet)
1	400
2	245
5	125
10	80
15	60
20	50
25	40

All water breaks, including "rolling dips", will be located and spaced to fit the terrain and existing available outlets.

Rolling dips can be used on steep (12% or more) heavily used primary skid trails.

The uphill end of water bars should extend into the side ditch line of the road and/or tie into the bank to fully intercept any ditch flows.

Stream crossings should be made at right angles wherever possible.

Bridges, culverts, or stable at-grade crossings are to be used when crossing streams. They will be designed to avoid or minimize changes in the natural stream channel morphology.

Pipe crossings should be sized using procedures in the NRCS Engineering Field Handbook. Cross drain culverts shall be at least 12 inches or larger in diameter to prevent the accumulation of debris at the inlet.

Pipes for stream crossings should be long enough to provide a top width for wide logging equipment or trucks and still have a minimum 1½:1 side slope on each side of the fill to the bottom of the channel.

A permit may be required from the US Army Corps of Engineers any time fill material is placed in a stream.

The minimum trail width will accommodate the equipment to be used (normally 10 feet). Width will be increased as necessary at curves and turnouts.

Trails should be placed outside the SMZ and should follow contour lines as much as possible with grades between 1 and 10%. Steeper gradients (11%+) are permissible for short distances, usually not exceeding 200 feet. No section of a skid trail should exceed 25 percent grade.

For best surface drainage and where conditions will allow, outslope the entire width of the trail. As a safety precaution on sharp turns and road gradients of 11% or more, and on clay or slippery soils, trails should be in-sloped.

Establish good road drainage with properly constructed and spaced ditch turnouts (wing ditches), broad-based dips, water bars, culverts, and bridges. Ditch turnouts shall be constructed so that storm flow will be dispersed and will not cut channels across streamside management zones.

Road fills should not restrict flow patterns or volumes of water movement through forested wetlands.

Washed crushed stone (1½ - 3 inches, ASTM C 33 size number 3 or 4) or other protective ground cover should be added to the last 100 feet of a harvest trail before it intersects a highway to prevent mud from entering the highway and causing driving hazards.

Immediately following use, harvest trails should be closed to traffic by an appropriate means. See the practice standard for Use Exclusion (Code 472). Temporary stream crossings should be removed.

Safe entrance and exit to the site should be assured.

CONSIDERATIONS

Construction of skid trails and haul roads is the primary forestry activity that can cause an increase in erosion and sediment yields unless construction has been well planned and designed.

Preplanning saves time and construction costs.

A preharvest plan should be developed. The approximate location of harvest trails, potential log landings, sawmill sites, and stream crossings should be shown. Timing of harvest should be included. Exact locations of watercourses and streamside management zones should be shown.

Use existing trails where practical, unless use of such trails would exacerbate an erosion problem.

Landings and trails should be located to preserve aesthetic qualities.

Side-hill locations permit good cross-drainage.

Timber bridges should be considered where culvert installation is not practical.

Prevention of erosion should consider specific components of the road cross-section: travelways, fill slopes, cut slopes, and roadside ditches.

Erosion control measures put into place immediately after fill slope construction have better potential to appreciably reduce sediment production compared to measures that are installed later.

Crossings over defined channels are the most critical points on a trail.

A recommended sequence of cutting and skidding is to harvest the furthestmost timber first. As areas or pockets of a cutting operation are completed, logging slash and debris can be placed on bare areas to provide ground cover or build sediment traps and barriers. Tree tops and laps can be placed in trails behind the operation. Trails can be stabilized as activity progresses toward the deck.

Landings should be located in advance of trail construction. Road approaches should have a low grade. Timber length - whether short log or tree length - the loading method, and type of hauling equipment used will dictate landing requirements.

On steep terrain, landings should be located as high on the slope as practical so that the fan pattern of primary skid trails converging on the landing disperses runoff over a wide area downslope rather than concentrating it to a point. On very long slopes with mid-slope trails and landings, primary skid trails can converge both from above and below the trail.

When possible, timber should be skidded in an uphill direction either to a contour primary skid trail or to more level ground. When downhill

skidding must be done, it should be confined to low gradient slopes to avoid concentration of water that can flow directly to a stream.

Landings and trails may be utilized as firebreaks.

Wherever possible, harvest trails should be built from the top down - it is much easier.

Trail grades should vary to avoid accumulation of water.

Provision should be made to remove trash and garbage from trails and landings.

Landings and trails may be used for wildlife food and cover plantings. See standard for Upland Wildlife Habitat Management (Code 645).

After completion of harvesting, trail maintenance will most often be the responsibility of the landowner.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.

Minimum documentation for this practice includes:

- Species to be planted
- Planting rates and method of planting
- Soil amendments
- Mulching requirements as applicable
- Site preparation requirements
- Planting dates
- Statement requiring compliance with all federal, state, and local laws
- Operation and maintenance requirements

OPERATION AND MAINTENANCE

When all silvicultural activities are completed, shape and smooth the trail surface as needed, ensure that drainage systems are functioning, and provide a ground cover on all bare soil.

Trails and landings may be closed after harvest operations for erosion control, safety and liability, and reduced maintenance costs.

Watercourses and water quality shall be protected during and after removal and transport of trees. Upon completion of harvest, landings and trails will be left in a stable condition.

Periodic inspections of landings and trails will be conducted and, where necessary, repairs will be made.

Landings and trails utilized as firebreaks will be properly maintained to accomplish this purpose.

Landings and trails no longer needed can be "put to bed" by removing high maintenance structures such as culverts and bridges, and can be restored to a vegetative cover by planting and seeding.

Closing of trails is advised at least until road surfaces are properly stabilized.

Unnecessary soil disturbance should be avoided.

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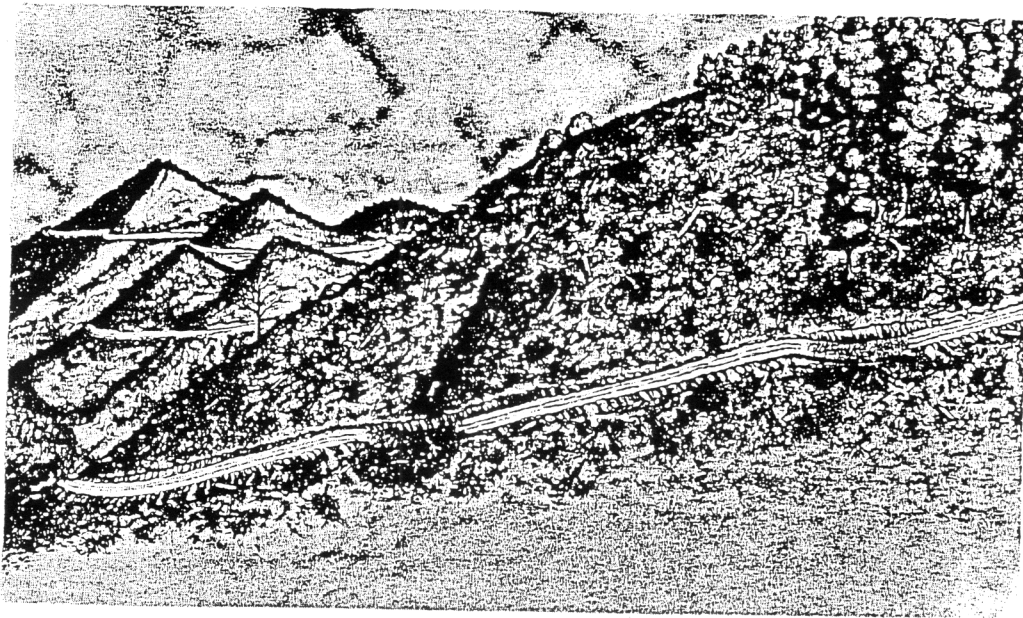
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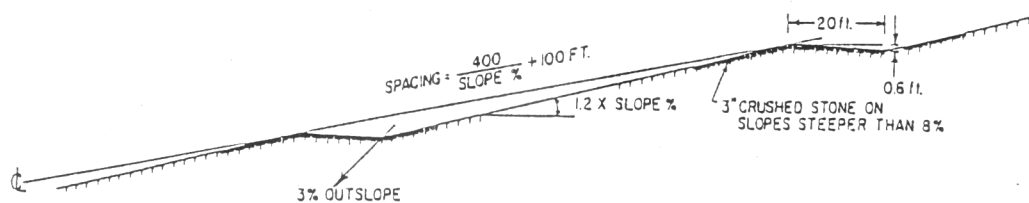
Exhibit 1

BROAD BASED DRAINAGE DIPS-DESIGN

This type of diversion is installed after the basic roadbed has been constructed and are used effectively when road grades are less than ten percent. The use of them does not increase wear on vehicles.



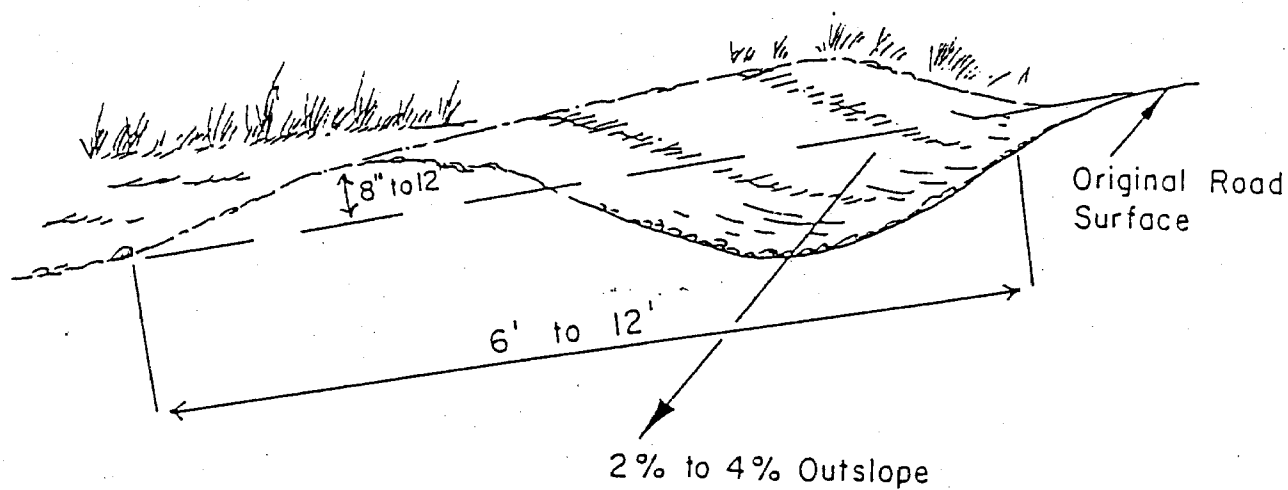
BROAD BASE DIPS ON A MOUNTAIN ROAD



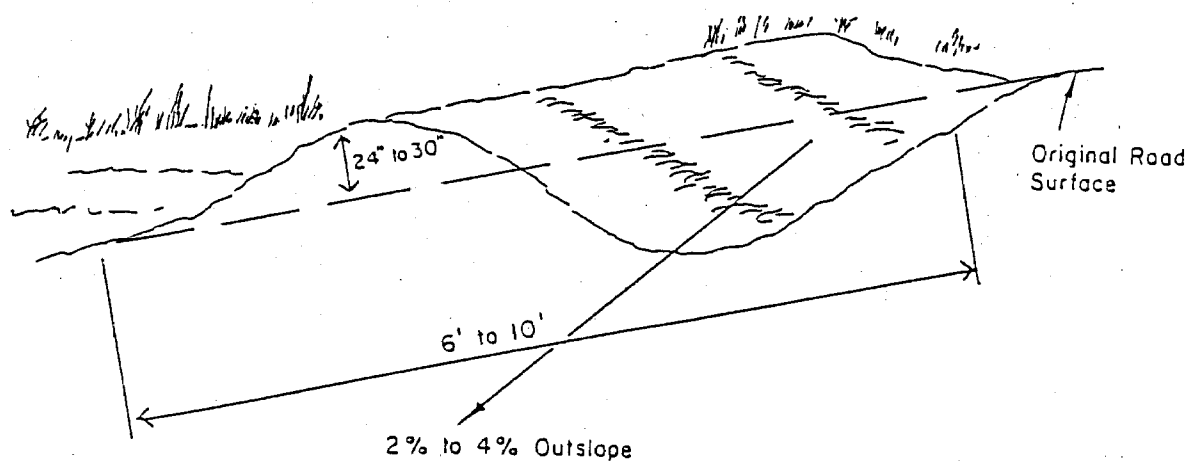
DESIGN OF A BROAD BASE DRAINAGE DIP

Exhibit 2

NARROW BASED WATER BREAKS



SHALLOW WATER BREAK



DEEP WATER BREAK